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## AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1 - 31. (Cancelled)

32. (Currently Amended) An apparatus comprising:

a silicon substrate;

a microresonator disposed on the silicon substrate, the microresonator having an annular structure to recirculate light at a desired wavelength, the microresonator including nanocrystals in a matrix; and

an LED disposed vertically relative to the microresonator to excite recirculation of light in the microresonator;

at least one patterned waveguide disposed above the microresonator, wherein light may be coupled between the microresonator and the at least one patterned waveguide;

a thickness of a film between the at least one patterned waveguide and the microresonator and between the LED and the microresonator; and

a CMOS circuit on the silicon substrate.

33. (Cancelled)

34. (Cancelled)

35. (Previously Presented) An apparatus as claimed in claim 33, wherein the microresonator is coupled between two waveguides.

36. (Previously Presented) An apparatus as claimed in claim 32, wherein the annular structure is a ring.
37. (Previously Presented) An apparatus as claimed in claim 36, wherein the ring has a length from a center of the ring to a center of a waveguide that forms the ring being proportional to an integer multiple of a desired wavelength.
38. (Previously Presented) An apparatus as claimed in claim 32, wherein the annular structure is a disk.
39. (Previously Presented) An apparatus as claimed in claim 38, wherein the disk has a perimeter that is an integer multiple of a wavelength.
40. (Previously Presented) An apparatus as claimed in claim 32, wherein the nanocrystals comprise silicon and are included in at least one of silicon nitride, and alumino-silicate.
41. (Previously Presented) An apparatus as claimed in claim 32, wherein the microresonator includes one or more rare earth elements.
42. (Previously Presented) An apparatus as claimed in claim 41, wherein the one or more rare earth elements includes at least one of erbium and ytterbium.
43. (Previously Presented) An apparatus as claimed in claim 32, wherein the LED is disposed on top of the microresonator.
44. (Cancelled)
45. (Currently Amended) An apparatus comprising:  
  
a silicon substrate;

a microresonator disposed on the silicon substrate, the microresonator having an annular structure to recirculate light at a desired wavelength, wherein the microresonator includes silicon nanocrystals, silicon-germanium nanocrystals, or a combination thereof;

a patterned waveguide disposed above and optically coupled with the microresonator, wherein a distance between the waveguide and the microresonator is equal to or less than 250 nanometers; and

[[a pump]] an LED disposed above [[or below]] the microresonator to excite circulation of light in the microresonator, wherein the LED emits light at a wavelength that is less than 900 nanometers;

a film disposed between the patterned waveguide and the microresonator, the film having a thickness to adjust an amount of coupling between the patterned waveguide and the microresonator; and

a CMOS circuit on the silicon substrate.

46. (Cancelled)

47. (Previously Presented) An apparatus as claimed in claim 45, further comprising a second waveguide optically coupled with the microresonator.

48. (Previously Presented) An apparatus as claimed in claim 45, wherein the annular structure is a ring having a length from a center of the ring to a center of a waveguide that forms the ring being proportional to an integer multiple of a desired wavelength.

49. (Previously Presented) An apparatus as claimed in claim 45, wherein the annular structure is a disk having a perimeter that is an integer multiple of a wavelength.

50. (Previously Presented) An apparatus as claimed in claim 45, wherein the microresonator includes one or more rare earth elements.

51. (Cancelled)

52. (Cancelled)

53. (Cancelled)

54. (Cancelled)

55. (Cancelled)

56. (Previously Presented) The apparatus as claimed in claim 45, wherein the patterned waveguide includes material deposited on the silicon substrate.

57. (Currently Amended) An apparatus comprising:

a silicon substrate;

a microresonator disposed on the silicon substrate, the microresonator having an annular structure to recirculate light at a wavelength, the microresonator including a rare earth and one or more of silicon particles and silicon-germanium particles ~~nano crystals comprising silicon~~ in an Al-SiO<sub>x</sub> matrix; and

a patterned waveguide optically coupled with the microresonator, wherein the patterned waveguide is positioned vertically relative to the microresonator;

an LED positioned vertically relative to the microresonator to excite recirculation of light in the microresonator.

58. (Cancelled)

59. (Cancelled)

60. (Cancelled)

61. (Cancelled)

62. (Previously Presented) The apparatus of claim 32, wherein the LED comprises a low power LED.